

CASE REPORT

Efficacy of an elimination diet in a patient with eosinophilic gastroenteritis : a pediatric case with multiple food allergies

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Abstract : Eosinophilic gastrointestinal disorders are chronic inflammatory diseases in which eosinophils highly infiltrate into gastrointestinal tissue, resulting in gastrointestinal dysfunction. Here, we report a case of pediatric eosinophilic gastroenteritis (EGE). A 7-year-old boy with multiple food allergies (cow milk, hen's egg, fish, shellfish, and chicken) was admitted to our hospital because of continuous abdominal pain and vomiting. His soy allergy had been diagnosed to have oral tolerance based on an oral food challenge at the age of 6 years. He was diagnosed with EGE based on biopsy findings showing eosinophilic infiltration (>20 eosinophils per high-power field) into the gastrointestinal mucosa. A diet eliminating soy, wheat, beef, pork, rice, and sesame in addition to the food that had already been eliminated and oral corticosteroids improved his symptoms and peripheral eosinophilia. A relapse of both abdominal pain and peripheral eosinophilia after the reintroduction of soy or pork identified them as foods causative of EGE. This report highlights the utility of elimination diets in improving EGE symptoms and the subsequent reintroduction of offending foods in identifying causative foods. Furthermore, EGE onset should be considered when introducing potentially allergic food in the management of food allergy. *J. Med. Invest.* 66 : 201-204, February, 2019

Keywords : child, diet therapy, eosinophilia, eosinophilic gastroenteritis, food allergy

INTRODUCTION

Eosinophilic gastrointestinal disorders (EGIDs), including eosinophilic esophagitis (EE) and eosinophilic gastroenteritis (EGE), are chronic inflammatory diseases characterized by gastrointestinal symptoms that feature a dense infiltration of eosinophils into the gastrointestinal wall (1). EGIDs are considered to be allergic diseases, which combine IgE- and non-IgE-mediated hypersensitivity. Common symptoms of EGE include abdominal pain, vomiting, appetite loss, weight loss, hypoproteinemia, and anemia. Because EGE leads to gastrointestinal stenosis or gastrointestinal perforation in severe cases (2), accurate diagnosis and prompt intervention are essential.

With regard to treatment, the utility of a 6-food elimination diet (6-FED) in EE, eliminating the six most common food allergens (milk, soy, egg, wheat, peanuts/tree nuts, and shellfish/fish), has been reported (3). However, the effect of an elimination diet, including 6-FED in EGE, has not been established.

Here, we report a case of pediatric EGE in which an elimination diet and subsequent reintroduction of the offending foods were useful in the improvement of EGE symptoms and identification of the EGE-causative foods, respectively.

CASE PRESENTATION

A 7-year-old boy was admitted to our hospital due to continuous

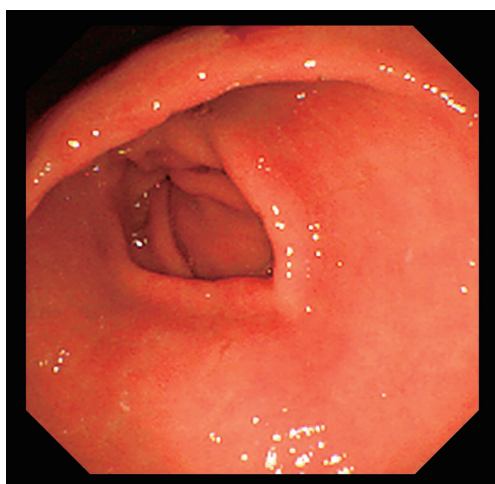
abdominal pain, vomiting, and positivity for fecal occult blood. He was diagnosed with milk allergy based on an immediate allergic reaction after ingesting milk at the age of 6 months. Due to their high allergen-specific IgE levels, wheat, eggs, soybean, chicken, sesame, fish/shellfish, and peanuts/tree nuts were also removed from his diet. Wheat elimination was discontinued because he ate wheat products at home without any allergic symptoms at the age of 4 years. His soy allergy was diagnosed to have oral tolerance based on an oral food challenge (OFC) at the age of 6 years. He had been administered cetirizine, pranlukast, and suplatast tosylate to treat allergic rhinitis.

Physical examination revealed no abnormal findings, except for a short stature (height, 107.8 cm ; -2.9 SD). Findings of laboratory blood testing were as follows : white blood cell count, 7600/mm³ (eosinophils, 2052/mm³) ; hemoglobin, 11.5 g/dL ; platelet count, 17 × 10⁴/mm³ ; C-reactive protein level, 0.08 mg/dL ; total protein, 6.6 g/dL ; albumin, 3.1 g/dL ; total IgE, 20982 IU/L ; egg white-specific IgE, 35.6 U_A/mL ; egg yolk-specific IgE, 54.0 U_A/mL ; milk-specific IgE, 87.5 U_A/mL ; soy-specific IgE, 24.0 U_A/mL ; wheat-specific IgE, 31.2 U_A/mL ; fish (codfish)-specific IgE, 75.6 U_A/mL ; pork-specific IgE, 69.5 U_A/mL ; beef-specific IgE, 49.2 U_A/mL ; chicken-specific IgE, 30.4 U_A/mL ; rice-specific IgE, 19.3 U_A/mL ; peanut-specific IgE, 25.8 U_A/mL ; and sesame-specific IgE, 29.3 U_A/mL. Computed tomography showed thickening of the pyloric wall and mild ascites. Gastrointestinal endoscopy showed that the surface of the gastric mucosa was rough, slightly erythematous, and friable (Fig. 1A). Histopathological findings of the biopsy specimen showed eosinophilic infiltration (>20 eosinophils per high-power field) into the gastric and duodenal mucosa (Fig. 1B and 1C). There were no obvious abnormalities in colonoscopy or biopsy findings of the colon and rectum. Based on his symptoms, peripheral eosinophilia, and biopsy findings, he was diagnosed

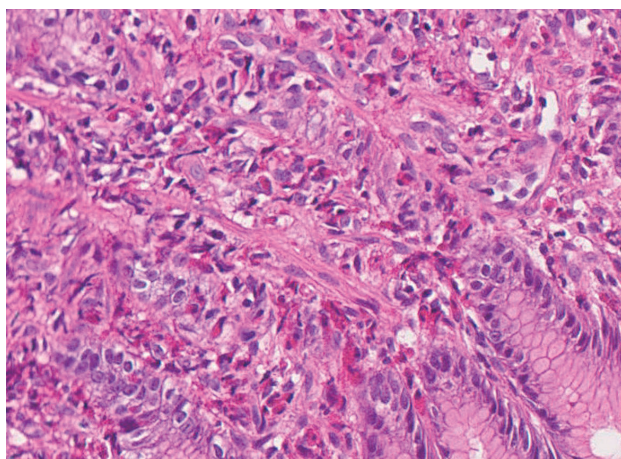
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A.



B.



C.

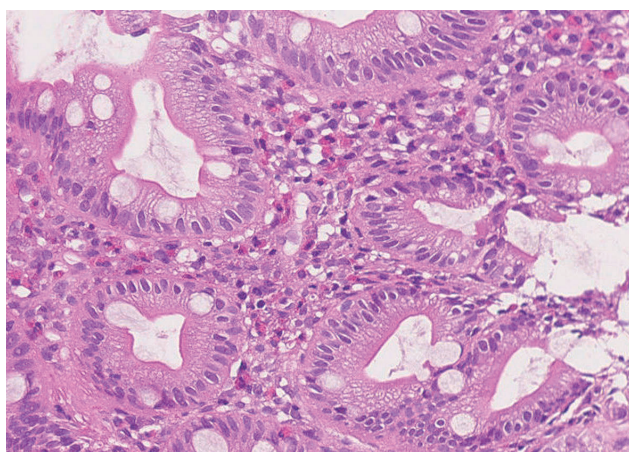


Fig. 1. Findings of gastrointestinal endoscopy and histology of biopsy specimen

The mucous of the gastric angle shows a rough, slightly erythematous, and friable appearance (A). The biopsy findings of both the gastric angle (B) and duodenum (C) show eosinophilic infiltration (> 20 eosinophils per high-power field) into the mucosal layer (hematoxylin and eosin staining, $\times 200$)

with EGE.

Because food was presumed to be the cause of the EGE based on his history of multiple food allergy, he was started on elimination diet therapy combined with an amino acid-based elemental diet to compensate for protein deficiency. Soy, wheat, beef, pork, and rice were eliminated in addition to the food previously eliminated (eggs, milk, fish/shellfish, peanuts/tree nuts, chicken, and sesame). Additionally, he continued to take pranlukast and cetirizine. Although his abdominal pain promptly resolved, his peripheral eosinophilia persisted. We started administering 15 mg per day (0.88 mg/kg/day) of oral prednisolone 13 days after starting the elimination diet. Because prednisolone quickly improved his eosinophilia, we gradually decreased it by 5 mg per week and completed the regimen in 3 weeks. The reintroduction of soy was performed 5 weeks after admission. He was able to eat 40 g of Natto per day without any symptoms for 2 weeks. Nevertheless, his abdominal pain and elevation of eosinophilia ($3350/\text{mm}^3$) recurred in 3 days after increasing Natto to 120 g per day. Rice and wheat were reintroduced without any symptoms; however, pork caused abdominal pain and peripheral eosinophilia. Based on the recurrence of abdominal pain and peripheral eosinophilia, soy and pork were identified as the foods causative of EGE in this case. His height increased to 113.1 cm (-2.5 SD) and his serum albumin level normalized to 4.2 g/dL 6 months after starting the dietary intervention. OFCs with fish (yellowtail) and chicken were also performed to screen for ingestible foods containing animal proteins; immediate allergic reactions appeared. Conjunctival edema and cough occurred 1 min after ingesting 5 g of fish. Pain in the oral cavity and pruritus of the face occurred 4 min after ingesting 3 g of chicken. He has continued the elimination diet and the amino acid-based elemental diet, and his abdominal symptoms have been under control.

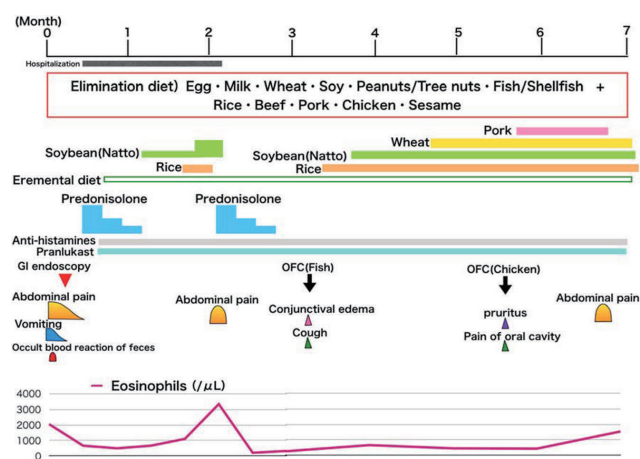


Fig. 2. Clinical course of the case

GI endoscopy, gastrointestinal endoscopy; OFC, oral food challenge

DISCUSSION

The pathology of EGIDs, including that of EGE, remains unknown. EGIDs are assumed to be diseases that cause dysfunction and stenosis of the gastrointestinal tract as a result of excessive immune responses against food or aeroallergens in the gastrointestinal mucosa with subsequent eosinophilic inflammation. The skin prick test and serum-specific IgE test are often utilized to

assess allergens causative of EGIDs (4). However, the involvement of T cell-mediated immune responses and Th2 cytokines, such as IL-5 and IL-13, has been reported to be more important than the direct involvement of IgE in the pathogenesis of EGIDs (5, 6), and EGID symptoms show delayed hypersensitive responses, lacking typical immediate responses (3). Additionally, 44%-63% of patients with EGIDs have other comorbid allergic conditions, such as atopic dermatitis, food allergy, asthma, and/or allergic rhinitis (7, 8), suggesting that they have already been sensitized to plural foods and/or aeroallergens. Therefore, it is not trivial to identify causative allergens in patients with EGIDs.

The utility of 6-FED in EGE has been controversial; however, the effect of 6-FED in improving EGE symptoms has been reported (9, 10). In our case, elimination diet therapy (i.e., eliminating 6-FED, beef, pork, chicken, rice, and sesame) was effective in improving the symptoms, and subsequent reintroduction was useful in identifying the EGE-causative foods. Our case is an example of the forced removal of multiple foods in addition to specific causative foods due to their potential of IgE-mediated allergic symptoms. Proper dietary management over a long period is necessary to improve the patient's malnutrition and promote his physical development.

In our case, the foods allowed for ingestion based on negative OFC results induced EGE. We identified soy and pork as foods responsible for the development of EGE in this case. The patient showed oral tolerance to soy, and administration of low amounts of Natto did not cause abdominal pain or eosinophilia; however, he remained intolerant to pork. In immediate-type food allergy, allergic symptoms are induced by ingesting causative food in amounts exceeding the threshold for allergy, i.e., in a dose-dependent manner. The usefulness of low-dose oral immunotherapy (OIT) for immediate-type food allergy has been previously reported (11). However, the onset of EGE/EE has been reported in OIT for the continuous ingestion of causative foods at high doses (12-14). Cell-mediated immunity is induced by the continuous ingestion of food allergens (15), and induction of allergen-specific lymphocytes causes gastrointestinal mucosal disorders (16). Sustained exposure to high doses of food allergens may trigger EGE onset.

As with soy in our case, the dose-dependent onset of EGE has been reported in a case with positive egg white-IgE (17). It is considered that EGE is a disease involving both the humoral and cell-mediated immunities against food allergens. Although it remains a matter of speculation, a pathogenic condition may be expressed as humoral immune-dominant EGE, which may present a dose-dependent pattern of EGE onset.

Although the principle of the management of IgE-mediated food allergy is the minimum elimination of causative food based on accurate diagnosis including OFCs, the possibility of inducing EGE due to continuing ingestion of the food even at amounts not showing immediate allergic symptoms in OFCs should be considered. Because the risk factors for EGE in patients with food allergy have not been clarified, further studies are necessary for the comprehensive management of food allergy.

The pharmacological treatment of EGE is performed in patients for whom elimination diet therapy is ineffective or infeasible. Corticosteroids are first-line anti-inflammatory drugs (1, 4). Although corticosteroids improve symptoms in most patients with EGE, they often relapse with the reduction or termination of the steroids (18). Consequently, the long-term administration of steroids is sometimes needed. In pediatric patients in particular, the side effects of steroids, such as growth suppression and osteoporosis, should be considered in addition to nutritional status. With regard to other pharmacotherapy for EGE, the utility of leukotriene receptor antagonists, histamine H1 receptor antagonists, sodium cromoglycate, and splatest tosylate has been reported (19-21).

Because the symptoms were sustained despite leukotriene receptor antagonists, histamine H1 receptor antagonists, and splatest tosylate administration before hospitalization, their effect was insufficient in our case.

In conclusion, this report highlights the utility of elimination diets in improving the symptoms and subsequent reintroduction in identifying EGE-causative foods. To date, reports supporting the utility of elimination diets in patients with EGE have only been retrospective studies or case reports (10, 22). Further studies are needed to validate its robustness and efficacy.

CONFLICT OF INTERESTS

The authors have no conflict of interest to disclose.

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